

# Site Survey Report

802.11b/g



## Berkeley College (NWK)

536 Broad Street  
Newark, NJ 07102  
U.S.A.

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INTERMEC TECHNOLOGIES CORPORATION

6001 36th Avenue West

Everett, WA 98203

U.S.A.

[www.intermec.com](http://www.intermec.com)

U.S. Professional Services Group 1-800-755-5505

U.S. service and technical support: 1-800-755-5505

U.S. media supplies ordering information: 1-800-227-9947

Canadian service and technical support: 1-800-668-7043

Canadian media supplies ordering information: 1-800-268-6936

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**Report prepared by:**

**Frank Wilcox  
Sr. Systems Analyst  
Intermec Technologies Corporation  
Ellington, CT 06029  
U.S.A**

**Tel: 860.454.0171  
E-Mail: [frank.wilcox@intermec.com](mailto:frank.wilcox@intermec.com)**

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## Warranty Statement

### Limited Warranty

-- North America --

The results contained in this Intermec Site Survey Report (“Report”) are warranted, for a period not to exceed eighteen (18) months from the date of this Report, to provide for one hundred percent (100%) RF coverage in the areas designated and marked in Appendix C of this Report – if the equipment enumerated in this Report, Appendix A, is installed, configured, and tested in specific compliance with this Report. If, immediately upon completion of installation, or during site certification, it is determined that RF coverage in accordance with Appendix C of this Report does not meet the requirements defined by Report documentation, and all other conditions of this Report have been met, Intermec will furnish additional Access Points and/or Antennas and the labor required to install the Access Points and/or Antennas to ensure specific compliance with this Report.

Any changes subsequent to the date of this Report to the facility’s structure, or parameters within the facility, may create the need for an additional Site Survey on the site for an additional fee. Changes include but are not limited to structural changes, addition or removal of storage racks, addition or removal of manufacturing equipment and any significant changes to inventory densities and the addition of any RF emitting device that could cause interference. This Limited Warranty does not warrant any level of performance of the System equipment installed.

IN NO EVENT SHALL INTERMEC OR ITS SERVICE PROVIDERS BE LIABLE FOR ANY INCIDENTAL INDIRECT, SPECIAL, CONSEQUENTIAL OR ASSOCIATIVE CONSEQUENTIAL DAMAGES WHATSOEVER, INCLUDING WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION, OR OTHER PECUNIARY LOSS, RESULTING FROM DEFECTIVE MATERIALS OR IMPROPERLY INSTALLED OR SERVICED SYSTEMS. THIS LIMITED WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESSED OR IMPLIED, WHICH MIGHT OTHERWISE ARISE WITH RESPECT TO THE SERVICES PROVIDED. NO ONE IS AUTHORIZED TO CHANGE OR ADD TO THIS LIMITED WARRANTY.

### Disclaimer

All RF products perform differently based on design, type of antenna, and antenna placement within or on the unit. While Intermec takes great efforts to ensure that the site survey does meet the standards set forth, Intermec cannot be responsible for the performance of non-Intermec client devices on the wireless network because of manufacturing differences and variations in the performance of these products.

## RESULTS SUMMARY

As a result of the RF Site Survey performed at Berkeley College (NWK), on May 04, 2010, Intermec Technologies Corporation makes the following recommendations concerning the desired area(s) of Radio Frequency (RF) coverage. This report includes details of the survey process, installation procedures and recommendations, equipment list with part numbers & quantities, and facility diagrams instructions and guidelines to be used in preparation of the RF Network.

### ***Access Points/Antennas Required For RF Coverage***

Based on the results of the site survey process the total number of Access Points needed for RF coverage was determined to be 10. The total number of Antennas needed for RF coverage was determined to be 0 Directional Antennas. A complete equipment list can be found in Appendix A.

### ***Areas of RF Coverage***

A discussion and tour were conducted to determine which areas of the facility would require RF network operation. Berkeley College (NWK) representative Teri Pegnataro coordinated the orientation walk-through. The site survey was conducted in the main product handling and storage areas throughout the facility. The survey did cover the office areas.

### ***Cautions Regarding RF Coverage***

The recommendations made in this report are based upon the existing product/material densities and layouts at the Berkeley College (NWK) facility at the time of the survey. Relatively minor changes to the product, material density and/or racking or product storage areas may invalidate the recommendations made in this report. It may then become necessary to modify the recommendations to account for the new conditions at the Berkeley College (NWK) facility. In this event Berkeley College (NWK) may be required, at their expense, to purchase a new Site Survey and, to either move installed equipment or to purchase additional RF equipment. Berkeley College (NWK) would also be responsible for providing any additional electrical or network cable runs needed to accommodate the revised recommendations.

### ***Network / System Performance***

Performance is dictated by numerous factors. The overall throughput of the LAN and/or WAN segments can positively or negatively influence the performance of a wireless RF network. Factors that may degrade RF performance can include but are not limited to:

Host and/or server utilization	Network design, network segmentation
Number of clients	Ethernet utilization rates
Switches, routers, gateways	Ethernet collision rates
Application software and database response times	Non compliant Ethernet cable standards

If performance is less than expected Intermec can provide network analysis services to help resolve these issues. Please contact your Intermec Service representative for further details.

Switches must be 802.1d compliant to allow RF devices to roam across the wireless network without interruption. If a switch is not 802.1d, compliant then users may experience an interruption of their network connection as they roam.

## **SITE SURVEY PROCESS**

### ***RF Site Survey Process***

- Orientation - An initial meeting with Berkeley College (NWK) to determine exact areas where RF data collection is required to meet Berkeley College (NWK)'s expectation as defined in the pre-survey sales documentation.
- RF Coverage Testing - A certified Intermec Global Services employee conducts the site survey and environmental study to establish the exact location of each network access point, the positioning of the antennas and to determine if the environment is conducive to the success of the system.
- Recap – A meeting with Berkeley College (NWK) that reviews findings of Site Survey and offers Berkeley College (NWK) the ability to ask any questions prior to the Intermec Global Services employee leaving Berkeley College (NWK)'s site.
- After all data is collected and analyzed, a comprehensive Site Survey Report is generated and sent to Berkeley College (NWK).

### ***RF Coverage Testing***

An Access Point was placed at (or near) a potential installation point to test coverage. A portable RF terminal is used to communicate with the Access Point. The portable terminal is used to determine the actual RF coverage pattern or area that is being provided by the Access Point. Depending upon the survey results of the first location additional tests may be performed. This process is repeated (as necessary) until all the areas, where RF network operation is desired, are covered. The results are then used to determine the total number of Access Points, types of antennas and exact locations that will provide coverage for Berkeley College (NWK) facility. Upon completion of the site survey, the Intermec personnel that performed the site survey walked through the facility and pointed out suggested locations for installing the RF network equipment to Berkeley College (NWK) representative, Teri Pagnataro.

### **Test Standards – Cisco Aironet 802.11 g**

Using the equipment specified Intermec will consider a Site Survey valid if the Signal to Noise Ratio (SNR), and the packet loss, is above the minimum appropriate level

23db SNR and a maximum packet loss of 10%

When a specific data rates are specified, the signal strength may not fall to the minimum SNR before exceeding the 10% Packet loss.

### **Equipment Used**

During the site survey process an Access Point and one of the End Devices were used to conduct the survey.

#### **Access Point**

- Cisco Aironet 1200 Access Point with 802.11b/g radio installed.

#### **End Device(s)**

- Laptop or other Windows based device using Cisco 802.11a/b/g PC Card radio running Cisco Aironet Client Utility (ADU).
- Intermec CK30 using Intermec Site Survey Software.

### ***Cautions Regarding RF Interference***

The presence of interference signals can degrade the performance of the RF network. During the site survey, the performance of the RF equipment is observed in order to determine if any signs of RF interference are present. Common sources of interference may include but are not limited to microwave ovens, cordless telephones and other RF systems. Attempts are made during the survey process to identify and accommodate these types of devices; however devices not in operation during the survey may not be detected during the survey process. Any introduction or change in location, operation or shielding of this type of equipment may invalidate the recommendations made in this report or completely prohibit use of RF equipment. It may then become necessary to modify the recommendations to account for the new conditions at the Berkeley College (NWK) facility. In this event Berkeley College (NWK) may be required, at their expense, to move and/or add additional RF equipment. Berkeley College (NWK) would also be responsible for providing any additional electrical or network cable runs needed to accommodate the revised recommendations.



## INSTALLATION PROCEDURES AND RECOMMENDATIONS

Prior to the actual RF Network installation, either Berkeley College (NWK) personnel or a contractor hired by Berkeley College (NWK) must perform the following site preparation steps. Any personnel responsible for the RF Network installation should be aware of these requirements, and ensure that they are prepared to facilitate the mounting of the Access Points and antennas during the actual RF Network installation. Specifics on equipment to order and precise Access Point locations can be found in Appendices A-C.

### ***Aironet Power Injector Locations***

- Each Aironet Power Injector requires a 120VAC 3-conductor grounded duplex outlet located within three feet of the equipment location. This should be a computer grade dedicated circuit. The breaker should be labeled as "RF POWER BRIDGE#". The # sign represents the number of each Aironet Power Injector location. If the Aironet Power Injector is to be mounted in a network closet or rack with dedicated power then it can be plugged into the available power.
- For Access Points powered by a Power Bridge it is not necessary to have 120VAC run to those locations.
- Where necessary each Aironet Power Injector must be protected from AC power surges, spikes, under voltage and over voltage situations. Berkeley College (NWK) may purchase and install a suitable UPS, at each Aironet Power Injector location. If required Berkeley College (NWK) must also provide required mounting brackets, Installation requirements will vary depending on the model and size of UPS selected.

### ***Access Point Locations***

- The Access Point uses a gravity retention scheme to hold it in place and is typically mounted vertically. It should be installed with the Status Indicator LEDs clearly visible from the floor. Mounting the Access Point in this fashion will allow basic RF network troubleshooting to be performed without using lift equipment.

There are three common methods of mounting Access Points. Both Berkeley College (NWK) personnel and the designated installer should make the determination on the best method.

1. Mount a piece of plywood or similar product approximately (3/4" x 24" x 24") vertically at the designated location prior to the scheduled installation date. It must be securely mounted before the scheduled installation date.
  2. Use beam clamps to attach the Access Point mounting bracket directly to ceiling or column structure.
  3. Install the Access Point in a sealed enclosure to protect it from the environment. The enclosure is then mounted to the building.
- Each Access Point not using Power Over Ethernet requires a 120VAC 3-conductor grounded duplex outlet located within three feet of the equipment location. This should be a computer grade dedicated circuit. The breaker should be labeled as "RF AP#". The # sign represents the number of each Access Point location.

- The Access Points requiring a 10BaseT connection to Berkeley College (NWK)'s Ethernet LAN. Prior to Intermec's installation, an RJ45 terminated Category 5 or better cable or junction box needs to be installed by Berkeley College (NWK) from their HUB or Switch to each of the Access Point locations. Berkeley College (NWK) must ensure that the installer certifies these network connections.
- Berkeley College (NWK) will need to provide static IP addresses and default gateway router IP address if not using DHCP for each Access Point. Berkeley College (NWK) must provide Sub-net mask, host IP address or controller IP address, if required, and provide a temporary IP address for the installer's notebook computer.
- To provide additional RF Network security, Berkeley College (NWK) may provide site-specific setting for these Access Point configuration options: LAN Domain, Network Name, and Security Settings. For additional information consult the Access Point Users Manual or your sales representative.
- Where necessary each Access Point must be protected from AC power surges, spikes, under voltage and over voltage situations. Berkeley College (NWK) may purchase and install a suitable UPS, at each Access Point location. As an alternative it is acceptable to install a centrally located UPS to drive these remote outlets.

### ***Antenna Locations***

- If Directional Antennas are required, then a piece of plywood, approximately ¾"x5"x5" square, may be required at each Directional Antenna location before the scheduled install date. Directional Antennas must be installed such that they have a clear line of sight towards the area where they will be providing RF coverage.
- Omni-Directional Antennas do not typically require any special mounting surface preparation. Omni-Directional Antenna(s) must be installed vertically (typically pointed towards the floor) with a clear line of site around the antenna. Any obstructions near the antenna may degrade the performance of the antenna and cause poor RF network operation.
- Any holes in walls for cable, special brackets or antenna masts must be completed.

### ***Network Cabling Requirements***

- The Ethernet cable that attaches the Access Point to the Ethernet topology must be installed by Berkeley College (NWK) or contractor hired by Berkeley College (NWK). The cable must be Category 5 or higher and the installer must certify the installed cable runs.
- All Network cables must be terminated with a proper connector or outlet junction box.
- All network infrastructures installed for use with the RF network must comply with accepted industry standards. Any deviation from these standards may cause less than optimum performance of the network.
- Any Patch Cables required are the responsibility of Berkeley College (NWK) to supply at time of installation.

### ***Installation Process***

- Site Review: During this walk through, the installer will visually inspect the installed AC outlets, Ethernet cable runs and other pre-installation requirements.
- Inventory of Equipment: The installer will unpack and conduct an inventory of the equipment to ensure all parts are accounted for.
- Access Point Configuration. The installer will configure the Access Points, and establish a network connection. The installer will use Berkeley College (NWK)'s previously assigned IP addresses.
- Access Point Installation. Depending on complexity, this process can consume up to 90 minutes per Access Point.

### ***Installation Requirements***

- The installer will require a work area with a desk, bench or table with at least two power outlets to configure the Access Points.
- It is the responsibility of Berkeley College (NWK) to provide any lift equipment necessary to safely access equipment installation locations
- The Intermec installer may require the assistance of Berkeley College (NWK)'s Maintenance Department. The maintenance employee will need basic hand tools, power tools, tie wraps, beam clamps and fasteners, etc.
- The Intermec installer will install the Access Points, antennas, coax cable and lightning suppressor (as required) with the assistance of Berkeley College (NWK)'s personnel. If lightning suppression is used, Berkeley College (NWK) must have a licensed electrician attach an appropriate ground to the suppressor bracket.

## RF Network Components

### ***1250 Power Injector***



### ***Cisco Aironet 1140 Series Access Point***



<http://www.cisco.com/en/US/products/ps10092/index.html>

## APPENDIX A

### RF Network Equipment Parts List

Quantity	Part #	Product Description
10	AIR-LAP1142N-A-K9	Cisco Aironet 1142N 802.11a/g/n-d2.0

### *Aironet Power Injector Equipment*

Quantity	Part #	Product Description
10	AIR-PWRINJ4	Power Injector for 1100/1200 Series

Please refer to Appendix E Site Notes for additional information

Cisco Access Point Controllers and any related software requirements are not included in this document. The sales team should provide the recommendations for the controllers in their proposal.

Any Patch Cables required are the responsibility of Berkeley College (NWK) to supply at time of installation.

## APPENDIX B

### Location Photographs



- **AP1:** AIR-LAP1142N-A-K9
- **Location:** Basement Floor near vending machines.
- **Notes:** mount to ceiling grid.



- **AP2:** AIR-LAP1142N-A-K9
- **Location:** Basement Floor inline with elevators.
- **Notes:** mount to ceiling grid.



- **AP3:** AIR-LAP1142N-A-K9
- **Location:** First Floor in hallway between Library and Bookstore (look for red mark)
- **Notes:** mount to ceiling grid.



- **AP4:** AIR-LAP1142N-A-K9
- **Location:** First Floor in hallway between Library and room 122 (look for red mark)
- **Notes:** mount to ceiling grid.





- **AP5:** AIR-LAP1142N-A-K9
- **Location:** First Floor in hallway between Library and room 122 (look for red mark)
- **Notes:** mount to ceiling grid.



- **AP6:** AIR-LAP1142N-A-K9
- **Location:** First Floor in hallway outside room 106 (look for red mark)
- **Notes:** mount to ceiling grid.





- **AP7:** AIR-LAP1142N-A-K9
- **Location:** Second Floor in hallway outside room 212.
- **Notes:** mount to ceiling grid.



- **AP8:** AIR-LAP1142N-A-K9
- **Location:** Second Floor in hallway outside room 214.
- **Notes:** mount to ceiling grid.



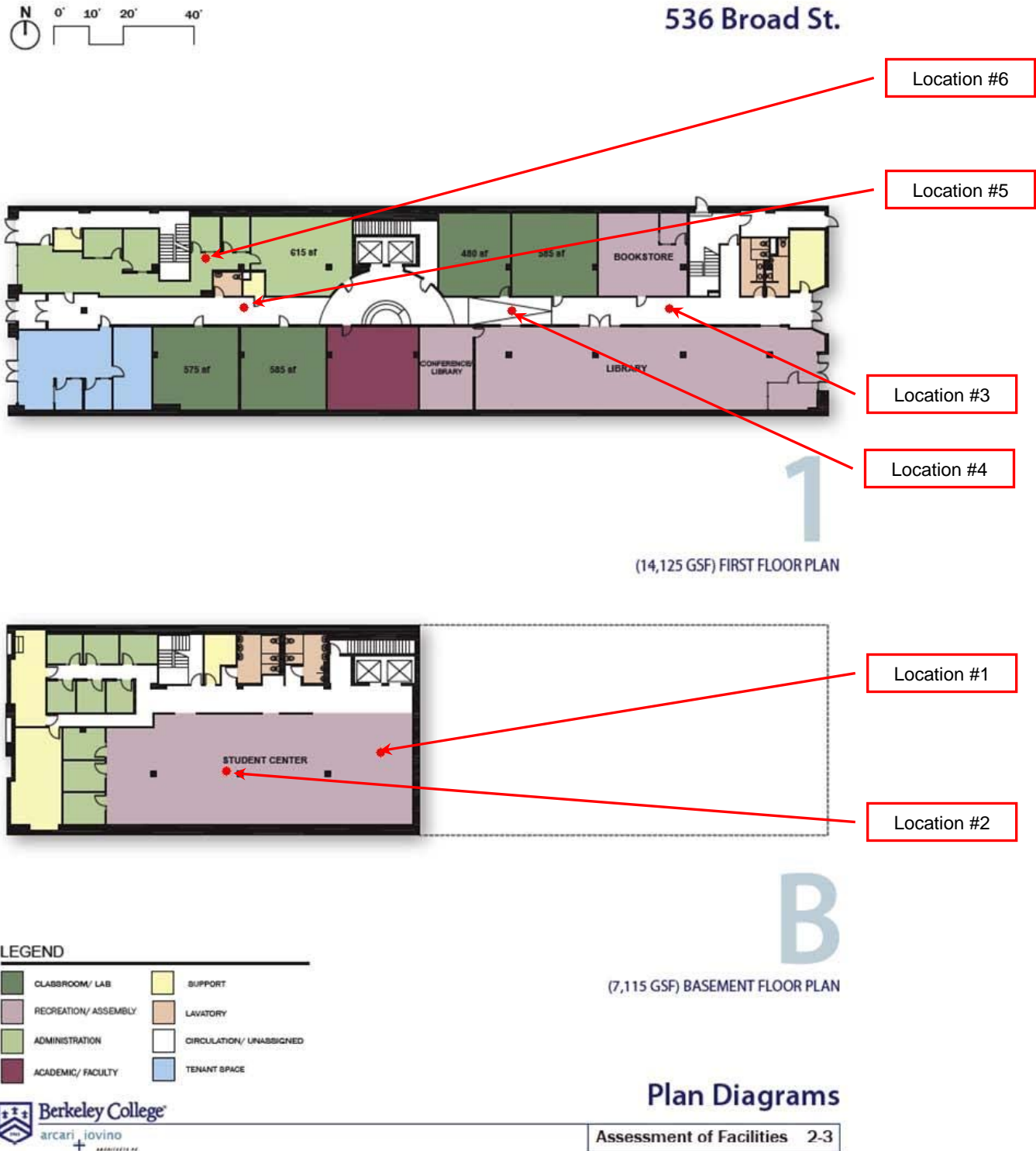
- **AP9:** AIR-LAP1142N-A-K9
- **Location:** Second Floor in hallway outside room 217.
- **Notes:** mount to ceiling grid.

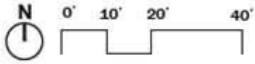


- **AP10:** AIR-LAP1142N-A-K9
- **Location:** Second Floor in hallway outside multi-purpose room.
- **Notes:** mount to ceiling grid.

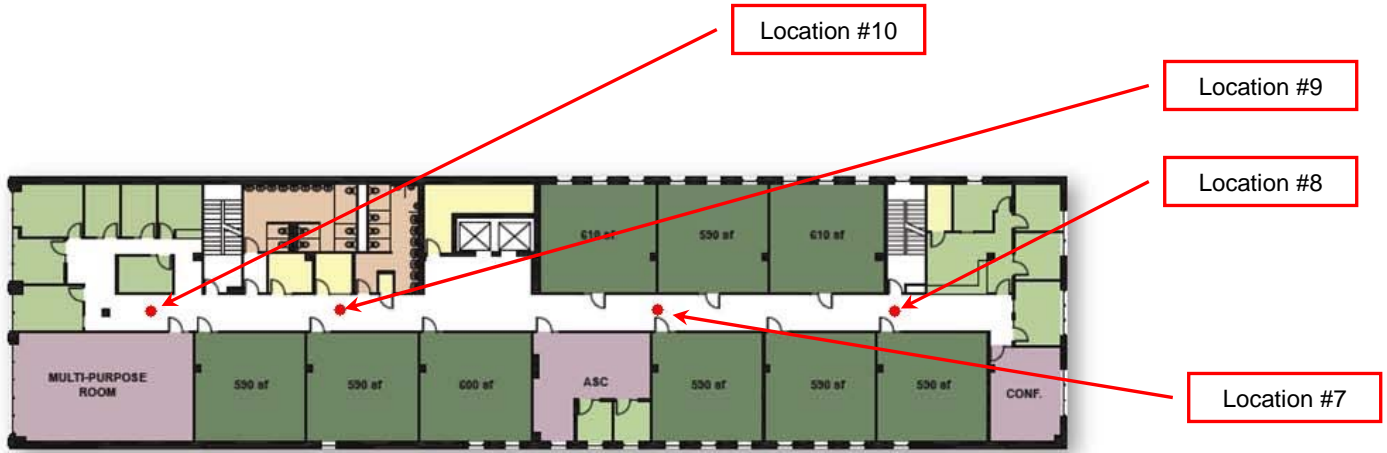
## APPENDIX C

### Facility Layout Diagram(s)





536 Broad St.



2

(14,125 GSF) SECOND FLOOR PLAN

LEGEND

CLASSROOM/ LAB	SUPPORT
RECREATION/ ASSEMBLY	LAVATORY
ADMINISTRATION	CIRCULATION/ UNASSIGNED



Plan Diagrams

Assessment of Facilities 2-4

## APPENDIX D

***Site Notes: All installed Access Point much be removed for this System to work correctly***

## Appendix E

### ***Other Services***

In addition to Site Surveys, Intermec Professional Services provides the services and products listed below. To request additional information or to schedule any of these services please contact your sales representative or the Intermec Professional Services Group.

### **Installations**

#### **Wireless Backbone Installation**

- Install and configure all network controllers per the site survey document. Configure and test all access points followed by installing them with antennas, cables, and associated mounting hardware, per the Site Survey.
- Install and test all components as specified by the Site Survey document.
- Test network connectivity to every Access Point and network controller.
- Test the facility for RF coverage per Site Survey.

#### **End Device Installation**

Install and configure End Device units, including handheld terminals, fixed mount terminals, printers, and accessories. For VMU devices the mounting brackets or power supplies must already be installed for Intermec to configure and attach the unit.

### **Site Certification**

For installations that want to be sure they are configured and operating at maximum efficiency.

- Verify that basic Access Point configurations are correct.
- Conduct a walkthrough to determine the Access Points and antennas are providing the necessary signal strength and data rate to provide requested levels of coverage.
- Verify that all Access Points are communicating properly with the wired network.
- Check coverage areas for possible interference.
- Verify the basic configuration of one of each type of end devices.

### ***Medallion Support Services – Hardware Maintenance***

#### **Medallion On-Site Service**

On-Site Service is designed for Intermec customers with mission-critical applications who want to have personalized, on-site administration and support. The program offers three response time options (four-hour, next-day, and two-day) from the time of your call.

#### **Medallion Silver Replacement Service**

Silver Replacement Service provides overnight delivery, warehousing, and inventory management services to deliver customer-owned replacement units to your facility within one day of your call.

#### **Medallion Depot Service**

Depot Support Service provides a choice of two-day and five-day guaranteed repair response times from the unit's arrival at an Intermec Repair Center.

### ***Contact Intermec***

To learn more about Intermec's Services, please call 1-800-934-3163 and mention Medallion Services or go to the Intermec Services Web Site:

<http://www.intermec.com/eprise/main/GSS/Service/Content/ServiceHome>

Intermec Technologies Corporation  
Corporate Headquarters  
6001 36<sup>th</sup> Avenue West  
Everett, Washington 98203



**Tel** 425.348.2600

**Service** 800.755.5505

**Fax** 425.395.9551

[www.intermec.com](http://www.intermec.com)

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